Three hundred and seventy-fourth meeting.

January 26, 1853. — QUARTERLY MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary laid before the Academy a letter from Professor Rokitansky, accepting membership of the Academy.

The President, on behalf of the sub-committee appointed last year to carry out the plan adopted by the Academy for a course of lectures in Boston, made the following report: —

"That a course of twelve lectures, by members of the Academy appointed for the purpose, has been completed within the last three months in this city.

"Through the liberality of John A. Lowell, Esq., of this city, Trustee of the Lowell Institute, the Academy have been furnished with a lecture-room, lights, attendance, and other accommodations, free of all expense.

"It will appear by the Treasurer's accounts, that a gross sum has been received from the proceeds of these lectures, which, it is believed, will be sufficient, after payment of expenses, to relieve the Academy from its immediate liabilities.

"The Committee are of opinion that the influence of this course of lectures has been beneficial to the Academy, by bringing the institution into nearer contact with the community at large, by making better known its character and claims, and by awakening public sympathy and liberality towards the objects of its pursuit. And they are led to believe that a repetition of such a course in future years may be made both creditable and advantageous to the Academy.

"Under this conviction, the Committee have made application to Mr. Lowell for an arrangement by which one course of the Lowell Lectures shall be delivered next year by members of the Academy, appointed for the purpose, the proceeds of the course to be devoted to the objects of the Academy. To this application, Mr. Lowell has returned an answer, which leads the Committee to believe that no obstacle will exist to carrying out the plan in a manner satisfactory to both parties.

"The Committee therefore recommend the passage of the following votes by the Academy.

" *Voted*, That the thanks of the Academy be presented to John A. Lowell, Esq., for the liberal and satisfactory manner in which he has caused them to be accommodated during the delivery of their late course of lectures.

" *Voted*, That the Academy will appoint twelve lecturers of their members to deliver one course of Lowell Lectures, on such subjects as shall be conformable to the objects of the Lowell foundation, and acceptable to the Trustee of the Lowell fund.

" *Voted*, That a committee be appointed, with full powers to make the necessary arrangements with Mr. Lowell for the above purpose, and also to appoint the lecturers, subject to the approval of the Academy.

" JACOB BIGELOW,
SAMUEL A. ELIOT,
GEORGE B. EMERSON, } *Committee.*

" *Boston, January* 20, 1853."

This report was accepted, with a slight modification in respect to the number of lecturers to be appointed; and the former committee, consisting of Dr. Bigelow, Samuel A. Eliot, and George B. Emerson, with the addition of Professor Treadwell and Professor Peirce, were chosen to take the subject in charge.

On motion of Professor Lovering, it was voted that the provisional list of members, printed for the use of the Academy, be permanently adopted.

On motion of Professor Gray, the list was referred to a committee of three, for their examination, to report at a future meeting.

Professor Gray, Professor Parsons, and Mr. Folsom were appointed on this committee.

Professor Peirce made a communication on the Ericsson engine, which has been regarded as showing that heat can be used over and over again as a motive power. The idea that power once used cannot be used again, he considered a fundamental rule, which has only a single exception, that of steam; and even this exception rests on two hypotheses, one assuming as certain the experiments which are said to prove it, and the other assuming that heat is power.

In the first place, he showed that this engine does not use the heat over and over again, and that when the air in the cylinders becomes expanded, in other words, whenever work is done (for no work is done while the piston is descending), heat is lost irrecoverably, and can only be resupplied by more fuel.

In the second place, he showed that, with the same amount of fuel, not so much work was done, nor was it so well done, as by steam. Still it was an exceedingly ingenious and well-perfected method of using hot air as a motive power, and in certain cases may become quite a rival of the steam-engine.

He gave a minute description of the different parts of the engine, illustrated by diagrams. In the large cylinder, the pressure never exceeds five pounds to the square inch, and never can, unless the heat be raised above 550°, which is the maximum temperature said to be used in Ericsson's engine; to get fifteen pounds to the square inch, he must heat his cylinder to 1000°, or to a red heat. Professor Peirce used 480° in his calculations.

This engine has four cylinders, nine strokes a minute, six feet to a stroke, and one hundred and fifty square feet of piston; it is said to consume only six tons of coal a day. Mr. Peirce calculated the working power of the engine to be only 116 horse-power; he compared this with the Baltic steam-ships with 2314 horse-power, twenty times the power of Ericsson's engine. To raise the Ericsson to the Baltic's power, one hundred and twenty tons of coal a day would be demanded, while the Baltic uses only eighty; so that the economy of fuel, one of the great advantages ascribed to the Ericsson, is in reality in favor of steam-vessels. The power of the Ericsson would be nothing against a head sea, and her speed of eight miles an hour on her trial trip is less than steam-vessels of inferior model made ten years ago. As yet the Ericsson engine has not only not surpassed steam-vessels, but has not even equalled them.

As to the alleged saving of heat, the Ericsson loses 60° of

heat at each stroke, which must be made up; the maximum heat in the wire-gauze apparatus is 30° below the heat in the cylinders; all the air in the cylinders must have supplied to it 60° of heat. At least one half a pound pressure to the inch, and probably much more, is required to force the air through the wire-gauze.

Dr. Bowditch alluded to the instrument called the "respirator," as analogous in its action to the wire-gauze in Ericsson's engine, in which the heat is often so retained as to be uncomfortable to the patient.

Professor Peirce observed that this apparatus of Ericsson was undoubtedly of great value for the working of his engine.

Professor Treadwell remarked that this same analogy to the "respirator" had been brought forward in 1847 in regard to Stirling's engine, which had an advantage over Ericsson's in using the same air over and over again. Air has an advantage of one half or two thirds over steam in the matter of specific heat, and if it could be used as conveniently without forcing-pumps, &c., it would be far superior as a motive power; but as yet the chief obstacles have not been removed.

Dr. W. F. Channing observed that Professor Peirce, in his calculations, had used the power necessary to double the speed in a given time as the *cube*, whereas, in the published accounts, it had been given as the *square;* and that thus so little power had been left (about $\frac{3}{4}$ lb. working power to the inch), that it seemed quite providential that the vessel had moved at all. To which it was replied, that when the element "space" is taken in the formula instead of "time," the *square* becomes doubled, or the *cube.*

Three hundred and seventy-fifth meeting.

February 1, 1853. — ADJOURNED QUARTERLY MEETING.

The PRESIDENT in the chair.

Professor Lovering reported that the map of the tornado at Medford was engraved, and that the report, by Professor